

## ASSIGNMENT 3

Textbook Assignment: "Forecasting Severe Weather Features," and "Sea Surface Forecasting."  
Pages 5-1 through 6-18.

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| <p>3-1. At what stage(s) in the life cycle of a thunderstorm should you expect updrafts to occur from below the base to the top of the cloud?</p> <ol style="list-style-type: none"><li>1. The cumulus stage</li><li>2. The mature stage</li><li>3. The dissipating stage</li><li>4. Throughout all stages</li></ol>   | <p>3-6. In what area of a thunderstorm does lightning most frequently occur?</p> <ol style="list-style-type: none"><li>1. Immediately beneath the storm</li><li>2. In areas with temperatures in the range of 0°C to -9°C</li><li>3. Within the "anvil" atop the cumulonimbus cloud</li><li>4. At the trailing edge of the thunderstorm</li></ol>                                       |
| <p>3-2. The least severe turbulence associated with thunderstorms is generally found at what location?</p> <ol style="list-style-type: none"><li>1. Near the top of the cloud</li><li>2. Near the base of the cloud</li><li>3. Near the freezing level</li><li>4. 1500 ft above the freezing level</li></ol>   | <p>3-7. What is the primary in-flight hazard associated with lightning?</p> <ol style="list-style-type: none"><li>1. Injury to personnel</li><li>2. Discomfort for personnel</li><li>3. Damage to radio equipment</li><li>4. Damage to aircraft structural components</li></ol>   |
| <p>3-3. Hail is associated with the mature stage of a thunderstorm and is found with the greatest frequency between which levels?</p> <ol style="list-style-type: none"><li>1. The surface and 5,000-ft level</li><li>2. The 5,000- and 10,000-ft level</li><li>3. The 10,000- and 15,000-ft level</li><li>4. The 15,000- and 20,000-ft level</li></ol>  | <p>3-8. Severe turbulence in thunderstorms is most frequently encountered within what stratum?</p> <ol style="list-style-type: none"><li>1. The 5,000- and 10,000-ft level</li><li>2. The 7,500- and 12,000-ft level</li><li>3. The 8,000- and 15,000-ft level</li><li>4. The 10,000- and 20,000-ft level</li></ol>   |
| <p>3-4. When the intensities of turbulence and precipitation are compared, what relationship should be assumed?</p> <ol style="list-style-type: none"><li>1. Turbulence intensity varies inversely with precipitation intensity</li><li>2. Turbulence intensity varies directly with precipitation intensity</li><li>3. The relationship between turbulence and precipitation intensities is dependent on the size of the thunderstorm</li><li>4. Turbulence intensity is not related to precipitation</li></ol> | <p>3-9. Lightning strikes are most likely to occur within which of the following thermal stratums?</p> <ol style="list-style-type: none"><li>1. Near or slightly above the 0°C isotherm level</li><li>2. Near or slightly above the -5°C isotherm level</li><li>3. Near or slightly below the -10°C isotherm level</li><li>4. Near or slightly above the -15°C isotherm level</li></ol> |
| <p>3-5. Which of the following activities produces electrical charges in cumulonimbus clouds?</p> <ol style="list-style-type: none"><li>1. Raindrops falling through the cloud produce static charges</li><li>2. The passage of another cloud with opposite polarity</li><li>3. A cloud passing in the vicinity of a high electrical field of opposite polarity</li><li>4. Opposite polarity within the cloud relative to the earth's surface</li></ol>  | <p>3-10. The mass of cool air that spreads out at the base of a thunderstorm as a result of downdrafts may develop into which of the following features?</p> <ol style="list-style-type: none"><li>1. A small low-pressure area</li><li>2. A small high-pressure area</li><li>3. A squall line</li><li>4. A microscale thunderstorm</li></ol>   |

3-11. How do pressure changes associated with a thunderstorm influence aircraft altimeter readings?

1. The altimeter reading decreases as the storm approaches and remains low until the storm moves away
2. The altimeter reading increases as the storm approaches, decreases while in the rain showers, and returns to normal as the storm moves away
3. The altimeter reading decreases in the cumulus stage of the thunderstorm, increases in the mature stage of the thunderstorm, and returns to normal in the dissipation stage
4. The altimeter reflects decreasing altitudes as the aircraft approaches the thunderstorm, increased altitude as the aircraft flies through the rain, and returns to normal as the aircraft flies away from the storm

3-12. A pilot sets the altimeter immediately before the passage of a thunderstorm. Following the passage of the thunderstorm, what should the altimeter read?

1. High
2. Low
3. Accurate

3-13. When the parcel method is analyzed on a Skew T log P diagram and used to forecast thunderstorms, which of the following statements is valid?

1. With a large positive area, thunderstorms may be forecast with a high degree of confidence
2. When thunderstorms are not indicated, you may safely assume that no thunderstorms will occur
3. The parcel method gives little indication of stability or instability when used alone as a forecasting aid
4. The size of the positive area is a good indication of instability, but other factors, such as the distribution of low tropospheric moisture, should be considered

3-14. Which parcel method condition, when considered alone, would NOT be favorable for thunderstorm development?

1. The negative energy area exceeds the positive energy area
2. The positive energy area exceeds the negative energy area
3. An ample supply of moisture is uniformly distributed throughout the lower troposphere
4. The parcel will rise to a temperature level of  $-10^{\circ}\text{C}$

IN ANSWERING QUESTION 3-15, REFER TO FIGURE 5-3 IN YOUR TRAMAN.

3-15. From an analysis of figure 5-3, you should draw which of the following conclusions?

1. The base of the inversion can be safely assumed to be the top of cumulus activity
2. Sufficient heating during the day will dissipate the low-level inversion; therefore, a forecast of thunderstorm activity may be made
3. In spite of favorable lapse rate conditions, there is insufficient moisture for thunderstorm development
4. Although the positive energy areas exceed the negative energy areas, due to the intensity of the low-level inversion, thunderstorms would probably not form

3-16. When the parcel method for mechanical lifting is used, what level(s) is/are determined on the Skew T log P diagram?

1. LCL
2. LFC
3. Both 1 and 2 above
4. LND

- 3-17. Which of the following procedures is NOT used in discounting regional forecasting of air-mass thunderstorms?
1. Dewpoint depressions of 13°C or more at any level within the 850- to 700-hPa stratum
  2. Dry air advection in the lower levels
  3. Freezing levels below 12,000 ft in an unstable cyclonic flow producing only light showers
  4. Dewpoint depressions of 15°C or greater at the 700- to 600-hPa levels
- 3-18. Stability indexes are most valuable in forecasting thunderstorms or showers in which of the following situations?
1. When used to forecast thunderstorm or shower activity for individual locations
  2. When plotted and analyzed on stability index charts for large areas, and evaluated in light of other synoptic considerations
  3. When plotted and analyzed on stability index charts and when used alone as indicators of probable thunderstorm activity
  4. When plotted for several locations, and conclusions of possible thunderstorm or shower activity are arrived at for each location in light of surrounding locations
- 3-19. When Showalter Index computations reveal an index of -4°C, what should be indicated for thunderstorm activity?
1. Light thunderstorms
  2. Moderate thunderstorms
  3. Severe thunderstorms
  4. No thunderstorm activity
- 3-20. The occurrence of a tornado is possible if a Showalter Index of
1. greater than 3°C is computed
  2. less than -2°C is computed
  3. greater than 6°C is computed
  4. less than -6°C is computed
- 3-21. Which of the following statements regarding the movement of thunderstorms relative to upper-level wind direction and speed is valid?
1. Upper-level wind direction and speed can be used as a guide in forecasting thunderstorm movement, but without a great deal of confidence
  2. Upper-level wind direction and speed can be used with considerable confidence in forecasting the direction of, but not the speed of movement of thunderstorms
  3. Upper-level wind direction and speed can be used with confidence in forecasting the speed of movement, but not the direction of thunderstorms
  4. The 700-hPa level winds can be used with a considerable degree of accuracy in forecasting both the speed and direction of movement of thunderstorms
- 3-22. Within the 10,000- to 20,000-ft stratum, most hail is encountered outside the thunderstorm.
1. True
  2. False
- 3-23. Which of the following phrases defines the Equilibrium level (EL) as used in the Yes-No hail forecasting technique?
1. The top of a negative area in a sounding where the saturation adiabat traced from the CCL intersects the temperature curve
  2. The top of the lowest positive area at the intersection of the dry adiabat
  3. The top of a positive area in a sounding where the saturation adiabat traced from the CCL intersects the temperature curve
  4. The area between the first positive and negative energy areas
- 3-24. When preparing hail size forecasts by using the Skew T log P diagram, you should trace the moist adiabat upward from the CCL to what dry-bulb temperature level?
1. 0°F
  2. 0°C
  3. -5°F
  4. -5°C

3-25. Most tornadoes in the United States occur during what season(s) of the year?

1. Fall
2. Midwinter
3. Summer and early fall
4. Spring and early summer

3-26. Which type of tornado is normally associated with squall lines?

1. Great Plains
2. Gulf Coast
3. West Coast
4. Eastern

3-27. Although the phenomena are not similar, the formation of both thunderstorms and fog originates in a moist, unstable air mass.

1. True
2. False

3-28. Frontal fog would be LEAST likely to form in which of the following areas?

1. In advance of a warm front
2. To the rear of a slow-moving cold front
3. To the rear of a fast-moving cold front
4. In the warm sector of a low-pressure area

IN ANSWERING QUESTION 3-29, REFER TO FIGURE 5-17 IN YOUR TRAMAN.

3-29. Assume that smoke was present during the day and night preceding the fog formation indicated in figure 5-17. What should be your forecast time of fog formation?

1. 0230 local standard time
2. 0330 local standard time
3. 0430 local standard time
4. 0530 local standard time

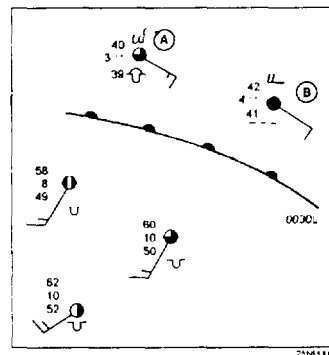


Figure 3-A

IN ANSWERING QUESTION 3-30, REFER TO FIGURE 3-A.

3-30. The warm front depicted in figure 3-A is located 40 miles southwest of stations A and B. It is forecast to move northeastward at 20 knots, and is expected to pass stations A and B at approximately 0230 local standard time. The wind will shift to the southwest at 16 knots. What should be your forecast for stations A and B at 0430 local standard time?

1. Heavy fog with possible drizzle
2. Moderate fog with possible drizzle
3. Low stratus clouds and possible drizzle
4. Stratocumulus clouds with unrestricted visibility

3-31. Which of the following meteorological situations is most favorable for the formation of radiation fog?

1. A clear, cool night with strong winds in a fast-moving, high-pressure area
2. A cloudy, warm night with light breezes in the warm sector of a low-pressure area
3. A clear, cool night with light breezes in a stationary high-pressure area
4. A sultry, humid evening with calm winds in the warm sector of a low-pressure area

3-32. What type of fog is formed when a warm, rainy air mass overrides a stable, continental polar (cP) air mass?

1. Frontal passage fog
2. Postfrontal fog
3. Radiational fog
4. Prefrontal fog

- 3-33. Postfrontal fog may be formed under which of the following conditions?
1. Two air masses are near saturation and accompanied by light winds
  2. The postfrontal air mass is temporarily heated from below
  3. Hydrocarbon fuels are present with a quasi-stationary frontal system
  4. A quasi-stationary east-west oriented cold front is present and the continental polar air behind the front is stable
- 3-34. Frontal passage fog may form where associated air masses are near saturation, with light frontal winds.
1. True
  2. False
- 3-35. Sea fogs tend to dissipate under which of the following conditions?
1. When the winds are greater than 6 knots
  2. When the underlying water continually becomes colder
  3. When there is radiational cooling from the warm water
  4. When the sea fog flows over warm land
- 3-36. Assume that a sounding is taken at a time when stratus clouds are observed over your location. Which of the following conditions will usually exist near the surface?
1. A moist adiabatic lapse rate
  2. A dry adiabatic lapse rate
  3. A shallow convective cloud deck
  4. A temperature inversion
- 3-37. You are using the dry adiabatic method to predict the height of the top of a layer of fog. The average mixing ratio line intersects the temperature curve at 20°C, and the dry adiabat of this intersection reaches the surface level at a temperature of 30°C. The top of this layer of fog will be at what height?
1. 1,000 ft
  2. 1,640 ft
  3. 3,280 ft
  4. 5,280 ft
- 3-38. The "critical temperature" is the surface temperature at which fog will
1. form, provided no changes have taken place in the sounding
  2. dissipate, regardless of changes in the sounding
  3. dissipate, provided no changes have taken place in the sounding
  4. form, regardless of changes in the sounding
- 3-39. A stratus layer is over your station when you take a morning sounding at 0600 local standard time, with a surface temperature of 8.5°C. The surface temperature at which dissipation will begin is computed to be 16°C, with dissipation to be complete when the temperature reaches 24°C. If heating is forecast to increase at the rate of 4°C per hour for the first 2 hours, and 6°C per hour for the next 3 hours, at what time should you forecast the stratus layer to dissipate?
1. 0915 local standard time
  2. 0945 local standard time
  3. 1015 local standard time
  4. 1045 local standard time
- 3-40. What causes a supercooled water droplet to freeze on contact with an aircraft at -3°C when it will not normally freeze until the temperature is between -10°C and -40°C?
1. The internal stability of the droplet is destroyed when it strikes the aircraft, and its freezing point is raised
  2. The surrounding air temperature is below 0°C, causing the water droplets to freeze immediately
  3. The airflow created by the engine creates sufficient disturbance to destroy the stability of the water droplets
  4. Supercooled water droplets normally freeze at -3°C
- 3-41. In the course of a flight from takeoff to landing, at what stage is a turbojet aircraft LEAST susceptible to icing?
1. When in the landing pattern
  2. When taking off
  3. When in final approach
  4. At cruising altitude and speed

- 3-42. In which of the following meteorological situations should you forecast the greatest probability of aircraft icing?
1. Cold air advection, temperature of  $-5^{\circ}\text{C}$ , and dewpoint depression of  $2^{\circ}\text{C}$
  2. Cold air advection, temperature of  $-7^{\circ}\text{C}$ , and dewpoint depression of  $3^{\circ}\text{C}$
  3. Warm air advection, temperature of  $-15^{\circ}\text{C}$ , and dewpoint depression of  $4^{\circ}\text{C}$
  4. Warm air advection, temperature of  $-10^{\circ}\text{C}$ , and dewpoint depression of  $3^{\circ}\text{C}$

IN ANSWERING QUESTION 3-43, REFER TO FIGURE 5-20 IN YOUR TRAMAN.

- 3-43. Assume that you have weak cold air advection between approximately 9,000 and 12,000 ft. On the basis of the temperatures and the dewpoint depressions, what should your icing intensity forecast be for this area?
1. Light
  2. Moderate
  3. Severe
  4. Extreme

IN ANSWERING QUESTION 3-44, REFER TO FIGURE 5-21 IN YOUR TRAMAN.

- 3-44. What determines the intensity of expected icing?
1. The size of the hatched area
  2. The value of the combined dewpoints
  3. The size of the area between the temperatures and the dewpoints
  4. The stability of the air mass
- 3-45. Which of the following icing conditions should be expected if the -8D curve is to the left of the temperature curve in an area with temperatures ranging from  $-10$  to  $-18^{\circ}\text{C}$ ?
1. Light glaze icing
  2. Light rime icing
  3. Light hoarfrost
  4. No icing

- 3-46. Wind shear produces turbulence because of eddies created due to tight vertical or horizontal gradients in wind velocity in a specific direction along the same line.

1. True
2. False

- 3-47. A pilot files a DD Form 175-1 for an IFR flight in a P-3 aircraft along a route that will cross over a mountainous area where mountain waves exist. If the height of the tallest en route peak is 5,280 ft, and the pilot can NOT avoid the area, what is the minimum altitude the pilot must maintain in flying over the area?

1. 3,440 ft
2. 7,920 ft
3. 11,160 ft
4. 11,280 ft

- 3-48. Turbulent eddies on mountain ridges usually exist in much deeper layers on what part of the slope?

1. At the highest peak
2. At the lowest base
3. On the windward side
4. On the leeward side

- 3-49. Clear air turbulence (CAT) is most frequently encountered in the winter months.

1. True
2. False

- 3-50. CAT occurs primarily at which of the following locations?

1. Poleward of the jet stream core
2. Equatorward of the jet stream core
3. Within the jet stream core
4. At the 40,000-ft level in warm troughs

- 3-51. Which of the following statements is NOT a valid characteristic of sea waves?

1. Sea waves are created by local winds
2. Sea waves are composed of a small spectrum of sine waves
3. Sea waves remain in their generating area
4. Sea waves are very irregular in appearance

- 3-52. What is the relationship, if any, between wave amplitude and wave height?
1. Wave amplitude equals one-half the wave height
  2. Wave amplitude equals the wave height
  3. Wave amplitude is twice the wave height
  4. None
- 3-53. State the relationship between wave frequency and wave period?
1. Wave frequency is twice the wave period
  2. The lower the wave frequency, the longer the wave period
  3. Wave frequency equals one-half the wave period
  4. The greater the wave frequency, the longer the wave period
- 3-54. If the mean period of a group of waves is 1.5 sec, what would be the group wave speed?
1. 6 knots
  2. 2 knots
  3. 8 knots
  4. 4 knots
- 3-55. What is the significance of the filter area in swell wave forecasting?
1. The filter area allows only certain frequencies of swell waves to arrive at the forecast point
  2. The filter area has little significance in swell wave forecasting
  3. The filter area allows all frequencies of swell waves to arrive at the forecast point
  4. The filter area allows only high frequency swell waves to arrive at the forecast point
- 3-56. What is the importance, if any, of the significant frequency range?
1. Low value frequencies with E-values greater than 5% are eliminated
  2. It determines the range of periods at the forecast point
  3. High value frequencies with E-values greater than 3% are eliminated
  4. None
- 3-57. When, if ever, does the energy transfer from the wind to the sea wave cease?
1. When the speed of the sea wave equals the speed of the wind
  2. When the speed of the sea wave exceeds the speed of the wind
  3. When the speed of the sea wave first exceeds one-half the wind speed
  4. Never
- 3-58. Which of the following statements is NOT accurate regarding fully developed seas?
1. Generated wave frequencies equal to or greater than the minimum frequency for the wind speed may be propagated
  2. The leeward portion of the fetch area is in a steady state
  3. Sea waves can not be generated at higher heights than the maximum value for the wind speed
  4. The windward portion of the fetch is in a steady state
- 3-59. What is the first step in preparing a wave forecast?
1. Determine the duration of the winds
  2. Determine a representative wind speed
  3. Determine a representative wind direction
  4. Locate the fetch area
- 3-60. Which of the following is the LEAST accurate measure of wind speed over a fetch area?
1. Ship observations
  2. Reports from ships traveling in opposing directions
  3. Uncorrected geostrophic winds
  4. Corrected geostrophic winds
- 3-61. Which of the following statements regarding curvature corrections is accurate?
1. Add a 10% correction to the geostrophic wind for moderately curved cyclonic curvature
  2. Straight isobars over shallow basins require a 10% correction
  3. For isobars with sharp cyclonic curvature, decrease the geostrophic wind by 10%
  4. For isobars with sharply curved anticyclonic curvature, decrease the geostrophic wind by 10%

- 3-62. The fact that longer period waves move faster than shorter period waves is best described by what term?
1. Dispersion
  2. Angular spreading
  3. Ekman spiral
  4. Spatial spreading
- 3-63. Which of the following characteristics is NOT affected when a wave "feels" bottom?
1. Wave length
  2. Wave period
  3. Wave speed
  4. Wave direction
- 3-64. The bending of a wave to conform to bottom contours is a definition of what term?
1. Shoaling
  2. Diffraction
  3. Angular spreading
  4. Refraction
- 3-65. Which type of breaker is characterized by a loud, explosive sound?
1. A spilling breaker
  2. A surging breaker
  3. A plunging breaker
  4. A cresting breaker
- 3-66. Surf zone width is normally measured in what increments?
1. Feet
  2. Meters
  3. Yards
  4. Fathoms
- 3-67. The Modified Surf Index is NOT applicable to which of the following landing craft?
1. LARC
  2. LCM-8
  3. LCAC
  4. LVTP-5
- 3-68. What type of currents are most pronounced in the entrances to large tidal basins?
1. Coastal currents
  2. wind-driven currents
  3. Eddy currents
  4. Tidal currents